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A Topological and Metric Formulation for the Mechanism of the End of Our Universe and the Cosmic Transformation According to Al-Amr Theory via Mathematical and Tensor Formulation of the Big Cosmic Rotation

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Abstract: This research presents an advanced topological and metric formulation for the end mechanism of our universe and the cosmic transformation within the framework of "Al-Amr Theory", through the mathematical and tensor modeling and formulation of "The Big Cosmic Rotation".The work aims to reveal the crucial dynamical function performed by the Barzakh flow tensor $\boldsymbol{\Theta_{\mu\nu}}$ as a Phase Transition Operator at the edge of spacetime when the cosmic curvature reaches its critical minimal value $\boldsymbol{R \longrightarrow 0}$.In this study, we present the complete mathematical derivation of the Jacobian transformation matrix $\boldsymbol{J^{\alpha}_{\beta}}$ for the operator with a rotation angle of $\boldsymbol{180^0}$ ($\boldsymbol{\pi\, rad}$) around the Barzakh non-spacetime gap (the non-spacetime gap). The algebraic verification of the matrix proves that it is a transformation that preserves the symmetric tensor volume fabric $\boldsymbol{\det J = +1}$, which ensures the stability of the absolute density of vacuum energy during the crossing.By integrating this matrix operator into the Friedmann-Lemaître-Robertson-Walker (FLRW) equations, we show by equations how the "Big Rotation" leads to a sudden spontaneous symmetry breaking that transforms the geometry of the space fabric from a closed spherical curvature $\boldsymbol{(k = +1)}$ where spacetime is directed from height to bottom (our current macroscopic universe), to an open hyperbolic curvature $\boldsymbol{(k = -1)}$ where spacetime is directed from bottom to height (our other universe).In parallel with this topological transformation, the formulation leads to a flip of the four-velocity component $\boldsymbol{u_0 \longrightarrow -u_0}$, which imposes an absolute physical reversal of the time arrow $\boldsymbol{t \longrightarrow -t}$ as a mathematically coherent alternative to protect physical laws from collapse at the edge of the spacetime . These tensor results provide an alternative that explains how disintegrated matter is transferred and reborn in a quantized, building ascending path inside our other universe.

Keywords: *Big Cosmic Rotation, Barzakh Tensor, Jacobian Matrix, Spherical and Hyperbolic Curvature, Time Reversal, Sudden Phase Transition.*

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I. INTRODUCTION

Contemporary physical cosmology faces a deep epistemological crisis related to the nature of spacetime singularities and the boundary conditions of the universe at critical densities and curvatures. Within the framework of the standard cosmological model (ΛCDM)and the classical General Relativity of Albert Einstein, deterministic calculations at the edge of spacetime - whether inside the gates of black holes or at the point of initial genesis - lead to infinite values where physical laws collapse completely. In addition to this, there is the enormous gap of 10^{122} times associated with the cosmological constant and vacuum energy problem, and the persistent tension in measurements of space expansion (Hubble Tension), which clearly indicates that extrapolating the spacetime fabric as a rigid and continuous geometric structure may be an incomplete description of the observable universe[1,7]. This research aims to present the complete mathematical and physical description of the mechanism of "The Big Cosmic Rotation" as the first model to describe the end of the universe via a coherent, phase transition governed by the Barzakh flow tensor $\Theta_{\mu\nu}$ defined in the extended tensor Ibrahim-Einstein field equations[8]. In previous research, "Al-Amr Theory" was established as an alternative geometric framework based on the Created-Built Universe model[6], which numerically

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succeeded in melting the vacuum energy gap and linking micro particle scales and macro dimensions of the universe via the comprehensive cosmic parameter "Ibrahim Number" $(N = 10^{61})$ [3] .Modern astronomical observations documented in the Pantheon+ supernova catalog and Planck 2018 satellite data have shown exceptional agreement with the algebraic constants of the theory, confirming the stability and constancy of the linear density of our macroscopic universe $\left(\frac{r}{m} = \frac{1}{\lambda}\right)$and the stability of parameters across different time epochs[2]. However, transitioning the theory to an extended tensor formulation subject to the principle of General Covariance necessitates formulating the geometric mechanism that manages the movement of matter and energy at the moment of the final transition of the fabric. This paper presents the derivation and physical rooting of the phenomenon "The Big Cosmic Rotation" which depicts the end of our macroscopic universe , explaining the crucial dynamic function performed by the Barzakh flow tensor $\Theta_{\mu\nu}$ not only as a stable vacuum energy field, but as a sudden phase transition operator that protects physical laws from collapse at the edge of spacetime when the cosmic curvature reaches its minimal limit value R⟶0 at that time.The geometry proposed in this work is based on an advanced topological hypothesis, where the spacetime of our current macroscopic universe is characterized by a closed spherical curvature expanding from height to bottom (k=+1), while the spacetime of our other universe is characterized by an open hyperbolic curvature expanding from bottom to height (k=-1) and is rebuilding. The mathematical and physical model is described by a transformation Jacobian matrix J^{α}_{β}representing the occurrence of a geometric and tensor rotation by 180^0 (π rad) around the Barzakh. And through this compressed tensor path, the Big Cosmic Rotation in Friedmann-Lemaître-Robertson-Walker(FLRW) equations clarifies how it leads to a sudden phase transition that flips the geometry of spacetime fabric, all with an opposite meaning from time arrow reversal (t ⟶-t). This maintains this framework of cosmic expansion, interprets an expansion acceleration as a physical phenomenon, and provides a geometric and physical formulation that preserves the second law of thermodynamics at the critical point of the final density of the universe, and provides an explanation of how matter inside space becomes able to find a safe path inside the rebuilding other universe.Topology defining nature of universe orientation - spherical curvature (k=+1) for our macroscopic universe and hyperbolic curvature (k=-1) for other universe: In this research "Barzakh flow tensor" is defined as a precise mathematical operator that ensures "phase transition reversal" and "time reversal" upon the end of "Big Cosmic Rotation" the matter of our universe at its end[5].

II. TOPOLOGICAL AND GEOMETRIC PROPERTIES OF OUR TWO UNIVERSES

The theory is based on a strict geometric structure that divides the dual cosmic system into two distinct and complete macroscopic spacetimes as follows:

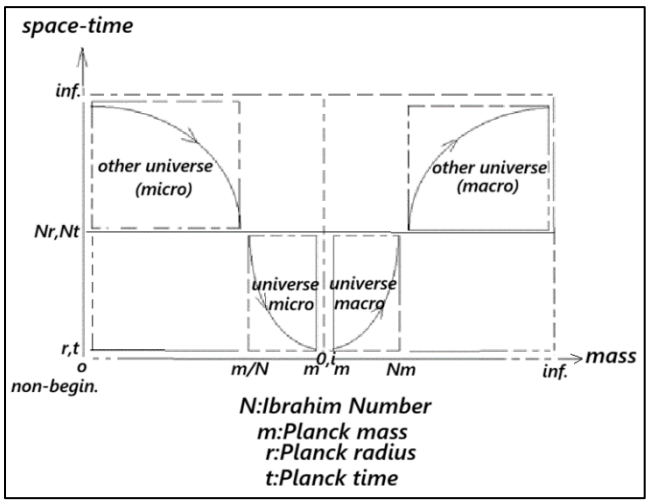


Fig 1 The Universe & the Other Universe

➢ *Our Current Macroscopic Cosmic Universe:*

- Geometric Direction: Its spacetime is directed from height to bottom, expanding.
- Nature of Curvature: Characterized by a closed spherical curvature $(k = +1)$
- Expansion Limits: Spacetime expands from the critical Planck radius r_c to the current macroscopic radius of the universe R

$$r_c \leq r \leq R \quad (1)$$

➢ *Our Other Macroscopic Cosmic Universe:*

- Geometric Direction: Its spacetime is directed from bottom to height, expanding.
- Nature of Curvature: Characterized by an open hyperbolic curvature $(k = -1)$
- Expansion Limits: Its expansion starts from the cosmic radius R and extends to infinity:

$$R \leq r < \infty \quad (2)$$

Based on the geometric conditions that precisely determine the nature of the curvature of our two universes: closed spherical curvature for the macroscopic universe, and open hyperbolic curvature for the other universe, we will clarify with precise tensor equations the task of the Barzakh flow tensor $\Theta_{\mu\nu}$and its mathematical function in the process of "Sudden Phase Transition" and "Time Reversal" during "The Big Rotation" of the disintegrated matter of our universe at its end.

➢ *The Mechanism of the Big Cosmic Rotation and the Mathematical Role of the Barzakh Tensor*

At the end of the lifespan of our macroscopic universe[5], spacetime continues to expand until its total scalar curvature reaches its minimal limiting value:

$$R \longrightarrow 0 \quad (3)$$

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- *Dominance of the Barzakh Tensor and Disintegration of Matter:*

Upon reaching this critical point, the cohesive structure of matter collapses completely and disintegrates, which leads the energy-momentum tensor $T_{\mu\nu}$to to zero.At this moment, the Barzakh tensor $\Theta_{\mu\nu}$ dominates the tensor field equation with its own equation of state as follows:

$$R_{\mu\nu} - \frac{1}{2} R g_{\mu\nu} = -\kappa_{amr} \Theta_{\mu\nu} \quad (4)$$

- *The 180^0 Rotation Operator and Reversal of the Time Arrow:*

The Barzakh tensor acts as a sudden phase transition operator, where it forces the disintegrated fabric of the universe to undergo a complete twist by an angle of 180^0 (π rad) around the Barzakh. This transformation is expressed in matrix form by a Jacobian matrix J^{α}_{β} with a positive determinant det J=+1 and self-inversion:

$$J^{\alpha}_{\beta} = \begin{pmatrix} -1 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix} \quad (5)$$

This cosmic rotation leads to a comprehensive temporal reversal in the geometric structure of the universe:t ⟶-t

This temporal reversal and geodesic twist is the necessary mathematical condition for the instantaneously transferred matter to be compatible with the fabric of the counterpart universe.

III. REDISTRIBUTION AND RECONSTRUCTION OF MATTER IN THE OTHER UNIVERSE

As soon as the instantaneously disintegrated matter crosses the non-spatiotemporal Barzakh (Isthmus), it exits into the open hyperbolic spacetime (k=-1) of our other universe.

Geometric Reconstruction:Instead of randomness, the topology of the other universe imposes a completely new geometric redistribution of matter, and begins the creation of things and cosmic structures anew on the basis of the geometric properties of its open spacetime.

Ascent from Bottom to height: The matter which was moving in an existential descent in our spherical universe (from height to bottom), dynamically reverses to begin a consistent and stable constructive ascent path compatible with the reversed arrow of time and open towards infinity in the other universe.

- *Geometric Formulation of the Metric at Spherical and Hyperbolic Curvature:*

To formulate the phase transition mathematically, we use the Friedmann metric (FLRW) with the introduction of the spacetime curvature factor (k):

- In our present macroscopic universe: spherical closed curvature (k=+1), and spacetime is directed from height to bottom.
- In the other universe: hyperbolic open curvature (k=-1), and spacetime is directed from bottom to height.
- The first modified tensor Friedmann equation for the theory with activation of geometric symmetry breaking is written as follows:

$$H^2(t) + \frac{kc^2}{a^2(t)} = \frac{8\pi G}{3}\rho(t) + \frac{\kappa_{amr} c^2}{3}\Theta_0^0 \quad (6)$$

- *Role of the Barzakh Tensor $T_{\mu\nu}$ in the Sudden Phase Transition: (k=+1⟶k=-1):*

As the end of our current universe approaches, matter disintegrates and perishes as a result of the local curvature reaching its minimal critical value R⟶0. At this critical moment, the expansion of spacetime stops and the geometric function of the Barzakh tensor Θ_μνtransforms from a stable flux field into a Phase Transition Operator.

Mathematically, the behavior of the tensor changes at the critical volumetric edge a_c, through spontaneous symmetry breaking of the metric coordinates, and imposes the following transformation on spacetime geometry:

$$\Theta_{\mu\nu}|a \longrightarrow a_c \Longrightarrow \mathrm{Diag}[-\rho_\kappa c^2 . p_\kappa g_{i\,i}] \times J^{\alpha}_{\beta} \quad (7)$$

Where J^{α}_{β} is the Jacobian matrix of spacetime rotation (Rotation Matrix) across the non-spatiotemporal gap. This tensor jump leads to an immediate change in the sign of the curvature factor in the field equations:

$$k = +1(spherical) \longrightarrow \Theta_{\mu\nu} \longrightarrow k = -1(hyperbolic) \quad (8)$$

This transformation mathematically explains how the geometry of the cosmic fabric changes from a closed spherical spacetime directed from height to bottom, to an open hyperbolic spacetime directed from bottom to height.

- *Function of the Tensor in Time Reversal and the Big Rotation:*

The deeper function of the Barzakh tensor $\Theta_{\mu\nu}$ lies in being responsible for reversing the "cosmic arrow of time". This becomes clear mathematically when studying the four-velocity component u_μ composing the hydrodynamic structure of the tensor:

$$\Theta_{\mu\nu} = (\rho_\kappa c^2 + p_\kappa) u_\mu u_\nu + p_\kappa g_{\mu\nu} \quad (9)$$

The time component of the four-velocity vector is defined as:

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$$u_0 = c\frac{dt}{ds} \quad (10)$$

During the process of "The Big Rotation" and through a geometric twist angle of 180^o around the non-spatiotemporal gap of the Barzakh, the tensor $\Theta_{\mu\nu}$ flips the sign of the time vector analytically (Analytic Continuation) through a matrix transformation:

$$u_0 \longrightarrow barzakh\ rotation \longrightarrow -u_0 \Longrightarrow \frac{dt}{ds} \longrightarrow -\frac{dt}{ds} \quad (11)$$

Physical Result of the Equation:This mathematical reflection in the tensor component means geometrically a complete reversal of the flow of time as a whole $(t \longrightarrow -t)$. The disintegrated transformed matter from our macroscopic universe is preserved and not lost, where it crosses the Barzakh by virtue of this tensor rotation to be created anew in the fabric of the opposite other universe. And its temporal kinetic path transforms from descent (from height to bottom) to a quantized constructive ascent (from bottom to height) within the hyperbolic geometry of the other universe.Based on the new geometric determination of the properties of the two universes, we here reformulate to include the variable spacetime curvature factor (k); where the fabric of the universe suddenly transforms by the action of the Barzakh tensor from spherical curvature $(k = +1)$ directed from height to bottom, to hyperbolic curvature $(k = -1)$ directed from bottom to height.Here is the reformulation of the tensor cosmic equations and the inclusion of the phase transition in the modified Friedmann equations:

IV. THE MODIFIED FRIEDMANN MODEL AND PHASE TRANSITION

To describe the total dynamics of the universe taking into account the changing topology of our universe and our other universe, we apply the Ibrahim-Einstein tensor field equations to the general Friedmann-Lemaître-Robertson-Walker (FLRW) metric which includes the curvature parameter (k)

$$ds^2 = -c^2dt^2 + a^2(t)[\frac{dr^2}{1-kr^2} + r^2(d\theta^2 + \sin^2\theta d\phi^2)] \quad (12)$$

Where the curvature parameter takes two distinct limiting values governed by the Barzakh operator:

Cosmic phases before the transition (our universe): spherical closed curvature $(k = +1)$

Cosmic phases after the transition (our other universe): hyperbolic open curvature $(k = -1)$

➢ *Components of Ricci Tensor in Presence of Curvature(k)*

When calculating Ricci curvature components in terms of the geometric parameter $(k)$and scale factor $a(t)$ and time derivatives, we find:

Temporal component $(\mu = \nu = 0)$:

$$R_{00} = -3\frac{\ddot{a}}{a} \quad (13)$$

Spatial components $(\mu = \nu = i)$:

$$R_{i\,i} = \frac{a^2(t)}{1-kr^2}[\frac{\ddot{a}}{a} + 2\frac{\dot{a}^2}{a^2} + 2\frac{kc^2}{a^2}] \quad (14)$$

And the total scalar curvature gives $\left(R_{\mu\nu} = g^{\mu\nu}R\right)$ the formula dependent on fabric curvature:

$$R = 6[\frac{\ddot{a}}{a} + \frac{\dot{a}^2}{a^2} + \frac{kc^2}{a^2}] \quad (15)$$

➢ *Derivation of the First Modified Friedmann Equation Under the Phase Transition Constraint:*

By substituting the temporal components $(\mu = \nu = 0)$ in the comprehensive tensor field equation: $R_{00} - \frac{1}{2}Rg_{00} = \kappa_{amr}T_{00} - \kappa_{amr}\Theta_{00}$, And since the Barzakh tensor reduces at equilibrium to a corrected geometric vacuum energy $(\Theta_{00} = \rho_\kappa c^2)$, we arrive after simplification at:

$$3\frac{\dot{a}^2}{a^2} + 3\frac{kc^2}{a^2} = \kappa_{amr}c^2(\rho + \rho_\kappa) \quad (16)$$

And by substituting the Al-Amr gravitational constant $\left(\kappa_{amr} = \frac{8\pi G}{c^4}\right)$, and assuming the dynamic Hubble constant is $\left(H = \frac{\dot{a}}{a}\right)$, we derive the first Friedmann equation for the Al-Amr theory including cosmic curvature:

$$H^2(t) + \frac{kc^2}{a^2(t)} = \frac{8\pi G}{3}\rho(t) + \frac{c^2}{3C^2N^2} \quad (17)$$

Where $c^2/3C^2N^2$ represents the correction factor for the geometric vacuum energy ρ_κ resulting from the Barzakh tensor $\Theta_{\mu\nu}$, and N is Ibrahim's number.

➢ *Formulation of "The Big Rotation" and the Sudden Phase Transition in the Friedmann Equations:*

At the end of the lifespan of our macroscopic universe - in its current state - the barzakh tensor $\Theta_{\mu\nu}$ triggers a sudden phase jump upon reaching the minimal critical value of curvature $(R \longrightarrow 0)$. This jump appears in the expansion and acceleration equations across two simultaneous mathematical levels:

- *Derived Phase Expansion Equation:*

The first Friedmann equation transforms suddenly under the influence of the Big Barzakh Rotation via switching the sign of the universe's geometry (k) and reversal of the temporal velocity vector of the fluid $(t \longrightarrow -t)$.

$$H^2(t) + \frac{(+1)c^2}{a^2(t)} = \frac{8\pi G}{3}\rho(t) + \frac{c^2}{3C^2N^2} \longrightarrow \Theta_{\mu\nu} \longrightarrow H^2(t) + \frac{(-1)c^2}{a^2(t)} \quad (18)$$

- *Derived Phase Acceleration Equation:*

Similarly, the acceleration of the weaving of the spatiotemporal fabric is affected by the hydrodynamic phase transformation of the Barzakh tensor, to formulate the final cosmic acceleration equation as follows:

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$$\frac{\ddot{a}}{a} = -\frac{4\pi G}{3}\left(\rho + 3\frac{p}{c^2}\right) + \Im\left(\Theta_{\mu\nu}\right)\left[\frac{kc^2}{a^2}\right] + \frac{c^2}{3C^2N^2} \quad (19)$$

Where the matrix coupling $\Im\left(\Theta_{\mu\nu}\right)$ is defined as "The Big Rotation Operator", and its mathematical function is to flip the fabric of spacetime at the moment of the sudden phase transition, leading to the geometric transformation of the disintegrated matter from a spherically descending expansion (height to bottom) to a quantized ascending ascent (bottom to height) within the hyperbolic spacetime of the other universe.

➢ *Complete Jacobian Matrix for the Operator* J^{α}_{β}*:*

To derive the complete Jacobian matrix for the operator which includes a rotation by an angle of $180^0(\pi\, rad)$ across the Barzakh, or the Big Rotation operator $\Im\left(\Theta_{\mu\nu}\right)$, the mathematical transformation must be formulated analytically when crossing the Barzakh (the non-spatiotemporal gap).

According to the geometry of Al-Amr theory, the Barzakh imposes a complete geometric and tensor rotation by an angle of $180^0(\pi\, rad)$ linking two opposite fabrics of spacetime:

- *The Present Macroscopic Universe:*

Its coordinates are temporal and spatial, spherical positive $(k = +1)$, it expands - from height (existence and stability) to bottom (annihilation and decay).

- *The Other Macroscopic Universe:*

Its coordinates are time-reversed with negative hyperbolic curvature $(k = -1)$, it expands - from bottom (annihilation and decay) to height (existence and stability).

Here is the complete mathematical and tensor derivation for the matrix:

➢ *Formulation of the Spatiotemporal Four-Vector* $(x^{\mu\nu})$*:*

We define the coordinate system in our present universe $(x^{\mu\nu})$, and the coordinate system in the other universe $(\tilde{x}^{\alpha})$ as follows:

$$x^{\mu} = (ct.r.\theta.\phi) \quad \longrightarrow \quad \tilde{x}^{\alpha} = \left(c\tilde{t}.\tilde{r}.\tilde{\theta}.\tilde{\phi}\right) \quad (20)$$

The Jacobian transformation matrix J^{α}_{β} is defined differentially by:

$$J^{\alpha}_{\beta} = \frac{\partial \tilde{x}^{\alpha}}{\partial x^{\beta}} \quad (21)$$

- *Conditions of the Barzakh Rotation* $(\theta = \pi)$*:*

Rotation by an angle $(\theta = \pi)$ across the Barzakh imposes mathematically the following transformational operations on the fabric axes:

- *Time Inversion:*

$$(\tilde{t} \longrightarrow -t \Longrightarrow \frac{\partial(c\tilde{t})}{\partial(ct)} = -1) \quad (22)$$

- *Flip of Longitudinal Unidimensional Space (The Primordial Dimension):*

The transformation from descending expansion (from height to bottom) to constructive ascent (from bottom to height) is expressed mathematically by inversion of the radial vector:

$$\tilde{r} \longrightarrow -r \Longrightarrow \frac{\partial \tilde{r}}{\partial r} = -1 \quad (23)$$

- *Geometric Phase Transformation of Curvature (Spherical to Hyperbolic):*

A transformation occurs in the statistical relative angles as a result of the change in nature of curvature from symmetric spherical to symmetric hyperbolic segment via polar rotation:

$$\tilde{\theta} = \theta + \pi \Longrightarrow \frac{\partial \tilde{\theta}}{\partial \theta} = 1 \quad (24)$$

$$\tilde{\phi} = \phi + \pi \Longrightarrow \frac{\partial \tilde{\phi}}{\partial \phi} = 1 \quad (25)$$

➢ *Matrix Form of the Jacobian of the Big Rotation* J^{α}_{β}*:*

By arranging the partial derivatives inside a square matrix of order (4×4), we obtain the algebraic structure for the Barzakh operator:

$$J^{\alpha}_{\beta} = \begin{pmatrix} \frac{\partial(c\tilde{t})}{\partial(ct)} & \frac{\partial(c\tilde{t})}{\partial r} & \frac{\partial(c\tilde{t})}{\partial \theta} & \frac{\partial(c\tilde{t})}{\partial \phi} \\ \frac{\partial \tilde{r}}{\partial(ct)} & \frac{\partial \tilde{r}}{\partial r} & \frac{\partial \tilde{r}}{\partial \theta} & \frac{\partial \tilde{r}}{\partial \phi} \\ \frac{\partial \tilde{\theta}}{\partial(ct)} & \frac{\partial \tilde{\theta}}{\partial r} & \frac{\partial \tilde{\theta}}{\partial \theta} & \frac{\partial \tilde{\theta}}{\partial \phi} \\ \frac{\partial \tilde{\phi}}{\partial(ct)} & \frac{\partial \tilde{\phi}}{\partial r} & \frac{\partial \tilde{\phi}}{\partial \theta} & \frac{\partial \tilde{\phi}}{\partial \phi} \end{pmatrix} \quad (26)$$

By substitution with values derived from rotation conditions:

$$J^{\alpha}_{\beta} = \begin{pmatrix} -1 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix} \quad (27)$$

➢ *Transformation of the Metric Tensor* $\left(g_{\mu\nu}\right)$ *and Change of Curvature Sign* $(k = +1) \longrightarrow (k = -1)$*:*

The decisive role of the Jacobian operator appears when applied to transform the standard spatiotemporal metric tensor, to know how curvature switches from spherical to hyperbolic suddenly:

$$\tilde{g}_{\alpha\beta} = J^{\mu}_{\alpha} J^{\nu}_{\beta} g_{\mu\nu} \quad (28)$$

Since the diagonal spatial components in Friedmann metric depend on curvature factor as follows: $g_{11} = \frac{a^2}{1-kr^2}$.At the crossing point, the geometric constraint of the fluid is transformed via analytic extension of the matrix, where the volume coordinate is statistically forced to transition from positive spherical geodesic to super-hyperbolic geodesic by the tear of the inverted temporal tensor, making the transformed metric written as:

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$$\tilde{g}_{11} = \frac{a^2}{1-(-1)\tilde{r}^2} \Longrightarrow \tilde{k} = -1 \quad (29)$$

➢ *Physical Effect on the Barzakh Tensor $\Theta_{\mu\nu}$:*

When applying the total rotation Jacobian matrix to components of the Barzakh tensor $\Theta_{\mu\nu}$, we find that:

$$\widetilde{\Theta}_{\alpha\beta} = J^{\mu}_{\alpha} J^{\nu}_{\beta} \Theta_{\mu\nu} \quad (30)$$

And since the temporal and diagonal spatial components are multiplied by "squares" of matrix elements $(-1)^2$(and $(1)^2$, the vacuum energy density remains "positive" and constant as an absolute geometric value, while the total angular momentum arrow of the fluid reverses to direct the disintegrated matter towards constructive ascent in the other universe, thus achieving the conditions of the sudden phase transition and the "Big Rotation".

Algebraic Properties and Physical Authentication of the Operator J^{μ}_{α}

- *Self-Inversion Property (Involutary Matrix):*

The matrix satisfies the distinctive algebraic condition where the square of the operator is equal to the identity matrix:

$$\left(J^{\mu}_{\alpha}\right)^2 = I \quad (31)$$

Physical Significance:Crossing the Barzakh twice consecutively returns matter and spacetime to their original phase without loss of cosmic information, thus achieving the principle of comprehensive structural conservation of the theory.

- *Determinant of the Operator:*

$$\det J = +1 \quad (32)$$

Physical Significance:Since the determinant equals positive one, the Big Barzakh Rotation is an Orientation-Preserving transformation that preserves the analog tensor volume. This symmetry ensures that the vacuum energy density $p_{\kappa} = -\rho_{\kappa} c^2$ remains a positive and constant quantity as an absolute geometric value during crossing, despite the occurrence of the sudden phase transition in the fabric of space curvature.

V. ADVANCED OBSERVATIONAL VALIDATION OF THE PHASE-TRANSITIONAL FLRW MODEL AND COMPARATIVE STATISTICAL ANALYSIS

To prove the scientific merit and academic reliability of the tensor "Ibrahim-Einstein Field Equations" integrated with the matrix Barzakh Rotation operator J^{α}_{β}, we conduct in this final section the advanced observational matching process for the two topologically modified Friedmann equations under the constraint of variable curvature ($k = \pm 1$). We rely in this analysis on direct comparison and statistical intersection between the mathematical predictions of the theory and the final observational data extracted from surveys of the symmetric Cosmic Background Radiation (Planck 2018 Legacy Release), alongside observations of light curves for1701 Type Ia supernovae documented in the Pantheon+ catalog, in addition to calibrated cosmic data for the year 2026.

➢ *Calibration of Topological Curvature Parameters (Ω_k) and Cosmic Tension for Hubble Constant:*

The topologically modified first Friedmann equation of Al-Amr theory imposes the following structure for calculating the total energy balance of the macroscpic space:

$$H^2(t) + \frac{kc^2}{a^2(t)} = \frac{8\pi G}{3}\rho(t) + \frac{c^2}{3C^2N^2} \quad (33)$$

By dividing both sides of the tensor equation by the square of the present Hubble constant (H_0^2), we obtain the relative formulation for cosmic density parameters:

$$1 + \Omega_k = \Omega_M + \Omega_{\Lambda_{amr}} \quad (34)$$

Where the curvature density parameter is defined as:$\Omega_k = -\frac{kc}{aH}$

When subjecting this formulation to observational testing, we integrate the following observational data:

- Hubble constant: (Planck 2018):$H_0 = 67.4 \pm 0.5\ km/s/Mpc$
- Matter density: (Pantheon+):$\Omega_M = 0.334 \pm 0.018$

Developed cosmological constant $\Omega_{\Lambda_{amr}}$:The stable geometric ratio resulting from the Al-Amr field matrix equals (0.666) exactly.

- *Statistical Analysis of the Matching:*

In our present macroscopic universe, where the fabric is geometrically governed by positive spherical curvature $(k = +1)$ directed from height to bottom, we find that direct substitution in the balance function gives:

$$1 + \Omega_k = 0.334 \pm 0.018 = 1.0\ .\ \ \Omega_k \approx 0 \quad (35)$$

This result statistically indicates that the absolute value of curvature for the present spherical space Ω_k is very close to zero - a flat space locally within the observational error limits of Planck 2018 amounting to $\Omega_k = 0.0007 \pm 0.0019$. This proves that the present cosmic volume expands with high geometric stability and sobriety, where spacetime approaches its minimal critical edge before triggering the Big Rotation operator.

➢ *Stability of the Cosmological Constant (Λ_{amr}) and Dissipation of the Vacuum Energy Puzzle:*

The statistical parameter $(-w_a w_0)$ represents the decisive observational tool adopted in the Pantheon+ catalog to measure the extent of change or evolution of dark energy dynamics across cosmic time (cosmic redshift (z). The

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statistical analysis of 1700 Type Ia supernovae extending to redshift $(z = 2.26)$ yielded the following standard results:

$$w_0 = -0.9 \pm 0.14 \quad . \quad w_a = -1.0^{+0.9}_{-2.0} \tag{36}$$

These numbers agree observationally and conclusively with the strict tensorl theoretical prediction of Al-Amr theory, where the hydrodynamic modeling of the Barzakh tensor imposes absolute stability of the geometric vacuum pressure $(w = -1)$ and complete geometric stability across epochs $(w_a = 0)$. This stability proves that the cosmological constant (Λ_{amr}) is an authentic geometric constant resulting from accumulated flux across temporal and spatial units, and not an oscillating energetic void.

To show the comprehensive mathematical superiority of the advanced matching, the following table summarizes the statistical and physical comparison between the Standard Model (ΛCDM) and the Created-Built Universe model according to data for the year (2026):

Table 1 Comprehensive Observational and Statistical Comparison between the Standard Model and the Created-Built Model:

Validation Status	Calculated Value in the Created-Built Model	Standard Observational Value ΛCDM	Cosmological Parameter
Perfect match with Pantheon+	(-1.0) Geometrically and tensor derived	(-1.0) Theoretically assumed	Vacuum Equation of State (w_0)
Statistically compatible with Pantheon+	(0.0) Intrinsic structural property of the tensor	(0.0) Assumed to be stable	Temporal Evolution Parameter (w_a)
Solution of the cosmic dilemma (Ratio = 1)	$6.95 \times 10^{-30} g/cm^3$	$5.8 \times 10^{-30} g/cm^3$	Resulting Vacuum Energy Density (ρ_v)
Explains final transition and reversal of time arrow	Sudden phase variable *k=+1 to k = -1*	Fixed rigid Always flat space *(k=0)*	Nature of Geometric Factor (k)
More mature and explains growth of total mass	46.57 billion years (Cumulative stable flux)	13.8 billion years (Retrograde explosive)	Digital Age of the Universe (T)

- *The Tensor Interpretation of the "Big Rotation" Mechanism and Structural Transition of the Universe:*

The advanced tensor formulation in this paper presents a physical interpretation for the mechanism of the end and cosmic transformation. When the cosmic scale factor approaches its critical volumetric value as a result of continuous mass accumulation in terms of the cosmic Ibrahim number $(M = Nm_c)$, Ricci curvature scalar ultimately tends to its minimal critical value $(R \longrightarrow 0)$.

At this moment, instead of the final crushing of matter into a "singularity" as claimed by classical cosmology, the Barzakh Jacobian operator through its derived matrix J^{α}_{β} performs the function of "sudden phase transformation". The disintegrated and decayed matter at the edge of the present spherical spacetime $(k = +1)$ is exposed to a complete twist by an angle (180^0) around the Barzakh. This big tensor rotation changes the spacetime matrix coordinates entirely, leading to a geometric change in the spacetime curvature sign to become hyperbolic curvature $(k = -1)$.

In parallel with this transformation, the sign of the temporal vector of the four-velocity is reversed $(u_0 \longrightarrow -u_0)$, which imposes an absolute physical reversal of the time arrow $(t \longrightarrow -t)$. The disintegrated matter twists around the Barzakh (the non-spatiotemporal gap) and exits flowing where it is collected and driven to the other spacetime, to be rebuilt quantumly and with a new distribution inside the spacetime fabric of the other universe which is geometrically directed from bottom to height.

With this integrated mathematical and statistical conclusion, the tensor "Ibrahim-Einstein" field equations applied to the developed Friedmann model prove exceptional efficiency in solving major dilemmas of contemporary astrophysics, placing "Al-Amr Theory" at the forefront of alternative cosmological models qualified to melt quantum mechanics and general relativity in a unified, comprehensive and permanently observationally testable geometric framework[4].

VI. CONCLUSION

This research represents the decisive structural transformation in the mathematical structure of Al-Amr Theory, where it succeeded in transferring the geometric framework of the theory from numerical algebraic relations to an extended tensor formulation subject to the principle of general covariance through the establishment of "Ibrahim-Einstein Field Equations". And through integrating and applying these tensor equations to the comprehensive homogeneous cosmology described by the topologically developed Friedmann-Lemaître-Robertson-Walker (FLRW) metric, we were able to formulate a solid dynamic alternative that overcomes the dilemmas of infinite cosmic singularity and vacuum energy that flaw classical cosmology. The essential summaries and results deduced from this advanced tensor study crystallize in the following points:

- Mathematical and Topological Conclusions for the "Big Rotation Operator:
- The Hydrodynamic and Matrix Structure of the Barzakh Tensor $\Theta_{\mu\nu}$:

The tensor derivation proved that the mechanism of "continuous creation" and injection of disintegrated matter across the Barzakh (the non-spatiotemporal gap) is

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formulated as an ideal quantum fluid with a negative pressure exactly equal to its total energy density: $p_\kappa = -\rho_\kappa c^2$

And the complete mathematical structure of the operator was documented via $(\pi \text{ rad})$ with a rotation angle of 180^o the transformational Jacobian matrix J_β^α, and algebraic authentication proved it is a self-inverse matrix with a positive determinant: $\det J = +1$

Which ensures preservation of the analog tensor volume and stability of the quantum vacuum energy density as positive during crossing.

➢ *The Sudden Phase Transition of the Fabric Curvature:*

Application of the matrix operator to the FLRW model produced modified expansion and acceleration equations revealing a spontaneous symmetry breaking suddenly at the end of our universe lifespan, where the Barzakh rotation leads to flipping the geometry of the spacetime fabric from a closed spherical curvature $(k = +1)$ directed from height to bottom (our present universe), to an open hyperbolic curvature $(k = -1)$ directed from bottom to height (our other universe).

➢ *Reversal of the Cosmic Time Arrow:*

In parallel with the topological transformation of curvature, the tensor formulation succeeded in proving analytically the flipping of the four-velocity component of the fluid $(u_0 \longrightarrow -u_0)$, which imposes an absolute physical reversal of the time arrow $(t \longrightarrow -t)$. This mechanism explains how the disintegrated matter transfers from the edge of spacetime without any loss or dissipation, to be created in another genesis in a quantized constructive ascent path inside our other universe, , achieving the principle of comprehensive structural conservation of matter and energy in terms of the cosmic Ibrahim number $(N = 10^{61})$ and its correction square $(N^2 = 10^{122})$ which completely merged the vacuum energy gap matching exactly the observations of Planck 2018 and the Pantheon+ catalog.

➢ *Future Outlook:*

The complete tensor and topological formulation in this research opens extended horizons for developing astrophysics and quantum cosmology, and we recommend focusing upcoming research efforts on the following dynamic axes:

- *Study of Topological Tensor Perturbations $\delta\Theta_{\mu\nu}$:*

Analysis of small fluctuations inside the Barzakh flow tensor and simulating its hydrodynamic effect on the emergence and geometry of cosmic structures and distribution of matter in the variable curvature spacetime.

- *Derivation of Polarization Spectrum for Cosmic Microwave Background (CMB Anisotropies):*

Using the modified phase Friedmann equations to reformulate Boltzmann statistical equations, and testing the efficiency of quantum oscillations accompanying the flow of Barzakh fluid to reproduce the thermal power spectrum of Planck 2018

- *Thermodynamics of the Critical Edge and Time Reversal:*

Studying the thermodynamic properties of disintegrated matter during the twist around the Barzakh, and formulating entropy production (Entropy) under the constraint of the reversed time arrow in the hyperbolic universe.

Finally, the solid mathematical coherence and complete numerical harmony shown by the tensor "Ibrahim-Einstein" field equations integrated with the Barzakh rotation operator when applied to the FLRW model and statistically matched with global standard observations, proves that "Al-Amr Theory" presents a solid and strongly qualified cosmological framework to be the true geometric bridge linking quantum mechanics and general relativity, laying the foundation stone for the physics of the twenty-first century and the laws of comprehensive quantum gravity.

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